



July 16, 2014

Joseph Laydon
Grafton Town Planner
Grafton Memorial Municipal Center
30 Providence Road
Grafton, MA 01519

Dear Mr. Laydon,

SunEdison, LLC has entered into contract with Tufts University to develop two solar photovoltaic (PV) facilities at the Cummings School of Veterinary Medicine at Tufts University campus in North Grafton. . This letter serves to summarize the purpose of the electricity to be generated, as well as the historic consumption of electricity at the Tufts Grafton campus.

Knoll Site

The Knoll Site PV facility will directly offset the consumption of electricity from the distribution grid at the Tufts-owned Grafton campus transformer. Each kilowatt-hour (kWh) of electricity generated by the Knoll Site PV facility will reduce the amount of electricity that Tufts' purchases from the utility company by one kWh.

From July 2013 through June 2014, the total kWh of electricity consumed at the Cummings School was 10.940 million kWh.¹ The Knoll site PV facility is projected to generate 3.373 million kilowatt-hours (kWh) of electricity in the first year of operation. That is, approximately 30% of the building's annual electricity use will be offset with less expensive solar electricity from the Knoll Site PV facility.

Science Park Site

While the Knoll Site project will directly offset electricity use at the Cummings School on a kWh-for-kWh basis, the Science Park PV facility will generate net metering credits to further reduce electricity costs at Cummings. The Science Park facility is a virtual net metering facility – it is interconnected to the electric grid in a manner that allows electricity generation at the Science

¹ FY2014 Tufts Grafton electricity consumption information from National Grid was provided by Tufts University.

Park site to offset electricity costs elsewhere on the campus. Electricity generated by this facility will be delivered directly to the grid, and the utility company will compensate Tufts for the value of this electricity at near-retail rate. This compensation will be provided in the form of net metering credits, which the utility company will apply to the Cummings School's electricity bill, further reducing Tufts' electricity costs at the Grafton campus. This interconnection approach maximizes the value of the solar PV facility to Tufts.

The Science Park project will generate approximately 1.592 million kWh of electricity in the first year. At the current National Grid net metering credit rate of \$0.162 per kWh, the estimated total value of net metering credits to be applied to the Tufts' Veterinary School building electric bill is \$258,000 in the first year.

Net Impact on Tufts' Electricity Use

Together, the Science Park and Knoll site PV facilities will not produce more electricity than can be used by the Veterinary School building, as seen below.

	FY2014 Consumption (kWh)	Anticipated Annual Generation (kWh)
Campus Service #1 (Veterinary School Building)	10,939,600 kWh	N/A
Campus Service #2	763,000 kWh	N/A
Knoll Site PV Facility	N/A	3,373,000 kWh
Science Park Site PV Facility	N/A	1,592,000 kWh
Subtotal	(a) 11,702,600 kWh	(b) 4,965,000 kWh
Net Impact (a)-(b)	6,737,600 kWh	-

Accessory Use

SunEdison would like to certify that total annual electricity production from the two planned PV facilities will not exceed the Cummings School's Grafton campus total annual electricity consumption. Consequently, the projects are not commercial generation facilities. SunEdison will be installing the PV systems exclusively for the purpose of generating power for the use of Tufts University. It is our position that these solar facilities constitute an accessory use. For permitting

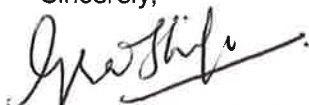
with the Grafton Planning Board, we wish to proceed with the project plan review process as outlined in Section 9 of the Grafton Zoning By-law.

For reference, we have attached the following supporting documentation:

- PVSyst report, Knoll Site PV Facility
- PVSyst report, Science Park Site PV Facility

We look forward to your consideration of our position, and we are available to provide additional information and address questions, as needed.

Sincerely,



Grace S Tangirala

Project Engineer D&E

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SunEdison

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Cc: E. Isenstein, Tufts

J. Poteete, Tufts

	PVSYST V6.12	Memc/SunEdison (USA)	18/07/14	Page 1/4
	Tufts Science Park MA-11-0159			

Grid-Connected System: Simulation parameters

Project : Tufts

Geographical Site Worcester Regional Arpt **Country** United States

Situation Latitude 42.3°N Longitude 71.9°W
Time defined as Legal Time Time zone UT-5 Altitude 300 m
Albedo 0.20

Meteo data: Worcester Regional Arpt TMY - NREL: TMY3 hourly DB (1991-2005)

Simulation variant : Tufts Science Park MA-11-0159

Simulation date 18/07/14 12h10

Simulation parameters

Collector Plane Orientation Tilt 20° Azimuth 0°
43 Sheds Pitch 6.20 m Collector width 4.00 m
Inactive band Top 0.02 m Bottom 0.02 m
Shading limit angle Gamma 29.58 ° Occupation Ratio 64.5 %

Models used Transposition Perez Diffuse Measured

Horizon Free Horizon

Near Shadings Mutual shadings of sheds

PV Array Characteristics

PV module Si-mono Model **MEMC-M320BYC-3Z**
Manufacturer MEMC
Number of PV modules In series 11 modules In parallel 348 strings
Total number of PV modules Nb. modules 3828 Unit Nom. Power 320 Wp
Array global power Nominal (STC) **1225 kWp** At operating cond. 1240 kWp (25°C)
Array operating characteristics (50°C) U mpp 415 V I mpp 2986 A
Total area Module area **7488 m²** Cell area 6708 m²

Inverter Model **AE 500TX-480**
Manufacturer Advanced Energy Industries, Inc. (AE)
Characteristics Operating Voltage 310-595 V Unit Nom. Power 500 kW AC
Inverter pack Number of Inverter 2 units Total Power 1000 kW AC

PV Array loss factors

Array Soiling Losses

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
7.5%	6.0%	2.5%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	5.5%

Thermal Loss factor U_c (const) 25.0 W/m²K U_v (wind) 1.2 W/m²K / m/s
Wiring Ohmic Loss Global array res. 2.1 mOhm Loss Fraction 1.5 % at STC
LID - Light Induced Degradation Loss Fraction 2.0 %
Module Quality Loss Loss Fraction -0.4 %
Module Mismatch Losses Loss Fraction 0.5 % at MPP
Incidence effect, ASHRAE parametrization IAM = 1 - bo (1/cos i - 1) bo Param. 0.04



Grid-Connected System: Simulation parameters (continued)

System loss factors

AC wire loss inverter to transfo	Inverter voltage	475 Vac tri		
	Wires	106 m 3x2500 mm ²	Loss Fraction	0.5 % at STC
External transformer	Iron loss (24H connexion)	2426 W	Loss Fraction	0.2 % at STC
	Resistive/Inductive losses	1.7 mOhm	Loss Fraction	0.9 % at STC
Unavailability of the system	3.6 days, 3 periods		Time fraction	1.0 %

User's needs : Unlimited load (grid)



Grid-Connected System: Main results

Project : Tufts**Simulation variant :** Tufts Science Park MA-11-0159**Main system parameters**

PV Field Orientation

PV modules

PV Array

Inverter

Inverter pack

User's needs

System type

Sheds disposition, tilt

Model

Nb. of modules

Model

Nb. of units

Unlimited load (grid)

Grid-Connected

20°

MEMC-M320BYC-3Z

3828

AE 500TX-480

2.0

azimuth 0°

Pnom 320 Wp

Pnom total **1225 kWp**

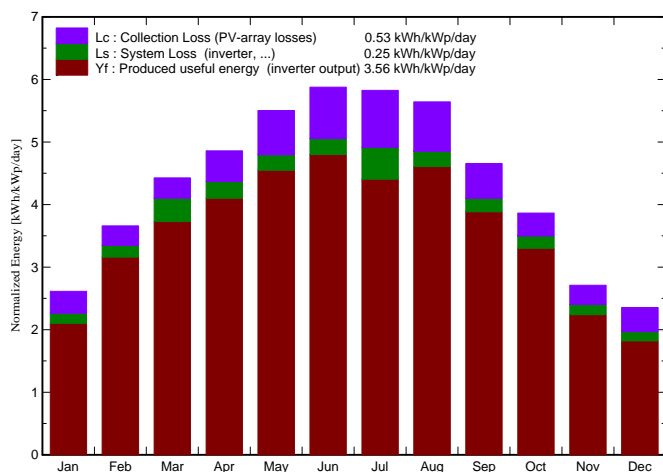
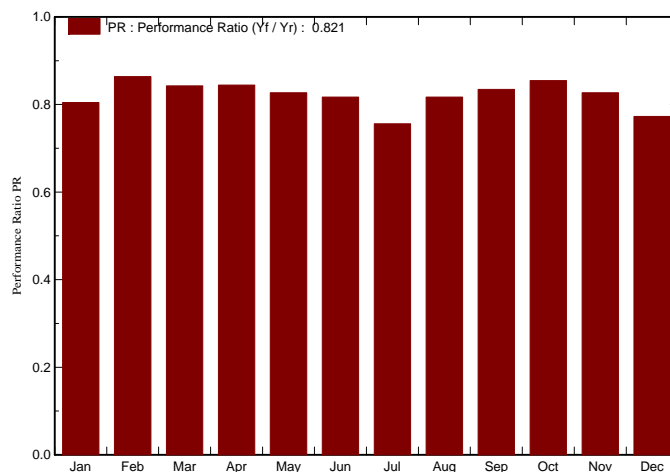
Pnom 500 kW ac

Pnom total **1000 kW ac****Main simulation results**

System Production

Produced Energy 1592 MWh/year
Performance Ratio PR 82.1 %

Specific prod. 1299 kWh/kWp/year

Normalized productions (per installed kWp): Nominal power 1225 kWp**Performance Ratio PR****Tufts Science Park MA-11-0159****Balances and main results**

	GlobHor	T Amb	GlobInc	GlobEff	EArray	E_Grid	EffArrR	EffSysR
	kWh/m²	°C	kWh/m²	kWh/m²	MWh	MWh	%	%
January	58.1	-6.80	81.0	66.7	85.9	79.9	14.16	13.16
February	79.8	-3.78	102.4	90.2	114.8	108.4	14.96	14.13
March	115.2	0.28	137.2	127.5	155.7	141.6	15.16	13.78
April	134.7	6.51	145.8	137.3	160.5	150.8	14.71	13.81
May	166.5	14.24	170.6	160.4	182.1	172.8	14.25	13.52
June	176.1	17.70	176.3	165.5	185.7	176.4	14.07	13.36
July	178.5	21.37	180.6	169.4	186.7	167.3	13.80	12.37
August	163.2	18.86	174.9	165.0	184.2	175.0	14.07	13.36
September	122.0	15.16	139.7	131.4	150.6	142.8	14.40	13.65
October	93.4	9.82	119.8	112.6	132.8	125.4	14.81	13.98
November	57.6	3.70	81.3	72.5	88.3	82.3	14.51	13.52
December	49.6	-1.72	73.0	59.4	74.8	69.2	13.67	12.64
Year	1394.7	8.01	1582.7	1457.9	1702.2	1591.8	14.36	13.43

Legends: GlobHor

Horizontal global irradiation

T Amb

Ambient Temperature

GlobInc

Global incident in coll. plane

GlobEff

Effective Global, corr. for IAM and shadings

EArray

Effective energy at the output of the array

E_Grid

Energy injected into grid

EffArrR

Effic. Eout array / rough area

EffSysR

Effic. Eout system / rough area

Grid-Connected System: Loss diagram

Project : Tufts

Simulation variant : Tufts Science Park MA-11-0159

Main system parameters

PV Field Orientation	System type	Grid-Connected	azimuth	0°
PV modules	Sheds disposition, tilt	20°	Pnom	320 Wp
PV Array	Model	MEMC-M320BYC-3Z	Pnom total	1225 kWp
Inverter	Nb. of modules	3828	Pnom	500 kW ac
Inverter pack	Model	AE 500TX-480	Pnom total	1000 kW ac
User's needs	Nb. of units	2.0		
	Unlimited load (grid)			

Loss diagram over the whole year

